Mad Roaring Mills

Fire and Fuels Report

Prepared by:
Josh Verellen
Assistant Fire Management Officer, Fuels

for:
Entiat Ranger District
Okanogan-Wenatchee National Forest

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Introduction

The Mad Roaring Mills (MRM) landscape has been impacted by natural and human-caused disturbances over the last several decades, leading to departures from desired conditions needed to sustain healthy forest conditions. When comparing against the expected natural range of vegetation variability, there is a decline of mature forested habitats and an increase in non-forest cover and young, stand-initiation forest cover on the landscape.

The focus of this analysis is to identify current fuels conditions in regards to Crown Fire, Flame Lengths and Burn Probability; and how they relate to historic reference conditions. These current conditions were run through analysis that compared a no action alternative summer wildfire versus either a spring or fall prescribed burn showing how noncommercial thinning (NCT) and prescribed burn treatments would affect intensity as it relates to historic reference conditions. These untreated areas will be analyzed in an attempt to take advantage of previous treatments on the landscape and create a more continuous treatment area as well as promote and protect existing mature forests.

The proposed activities of noncommercial thinning and prescribed burning are mainly what this analysis focus is upon. The prescribed burning this project proposes, aims to reduce fire line intensity, and uses reductions in fuel loadings to reduce these intensities. Connected actions include noncommercial thinning where dense stands of small natural occurring or planted trees are thinned, and/or pruned, and/or piled, and later pile burned. The NCT is being proposed to increase diameter growth of the best growing trees, thin out and release individual trees, increase historical spacing patterns, as well as reducing ladder fuels leading to crown fire. After the pile burn, prescribed under burning is planned to occur. There is no analysis done on pile burning, however that is not the focus of this report. For the purpose of this report, pile burning is considered a method of reducing the slash produced from the NCT efforts, in preparation for the prescribed burn.

Fire and fuels are directly related to the purpose and needs listed below by addressing Fireline intensity issues now and in the future through fuel reductions. These fuel reductions are to connect previously treated areas and help break up major fire flow paths.

The *purpose* of this project is to:

- Reduce the future risk of uncharacteristic wildfire.
- Accelerate development of tree growth and protect existing mature forests across the landscape to provide for future forested landscapes.

There is a *need* for action because:

- There is currently more forest in the stand-initiation structure class compared to historical reference conditions
- There is a need to maintain low hazardous fuels conditions to reduce the threat of future uncharacteristic wildfire to adjacent private landowners, support fire as a natural process and provide for long-term firefighter and public safety.

Issues to be addressed

How will the proposed fuels treatments within each Alternative; including the No Action Alternative, modify or alter the characteristics of fire behavior on the landscape.

Methodology

The Standard Fire Fuel Models: A comprehensive set for use with Rothermel's Surface Fire Spread Model (Scott & Burgan 2005) used to represent surface and ground fuels within treatment units. Individual fuel models were identified using Interagency Fuel Treatment Decision Support System (IFTDSS) and EMDS outputs. These fuels models were utilized in IFTDSS to show current and future conditions for No Action and an Action Alternative. A simple and intuitive interface provides the ability to model fire behavior across an area of interest under a variety of weather conditions and easily generate downloadable maps, graphs, and tables of model results. Additionally, the application provides a step-by-step process for testing a variety of fuels treatment impacts (thin, clear cut, prescribed burn) on fire behavior and comparing results to determine which modeled treatment best achieves desired results in terms of reduced fire behavior potential. It can be used at a variety of scales from local to landscape level. One core component of the IFTDSS model were utilized for this comparative analysis: Fire Behavior and Burn Probability.

The Fire Behavior and Burn Probability fire mapping and analysis model (Finney 2006; Stratton 2006) is component of IFTDSS that describes potential fire behavior for constant environmental conditions (weather and fuel moisture). Fire behavior is calculated for each pixel (30 meter square pixel) within the landscape file independently, so this program does not calculate fire spread across a landscape. Potential fire behavior calculations include surface fire spread, flame length (Rothermel 1972), crown fire initiation (Van Wagner 1977), and crown fire spread (Rothermel 1991). Because environmental conditions remain constant, the model will not simulate temporal variations in fire behavior caused by weather and diurnal fluctuations, such as *FARSITE* does. Nor will it display spatial variations caused by backing or flanking fire behavior. These limitations need to be considered when viewing outputs in an absolute, rather than a relative sense. However, outputs are well-suited for landscape level comparisons of fuel treatment effectiveness, because fuel is the only variable that changes. Outputs and comparisons can be used to identify combinations of hazardous fuel and topography, aiding in prioritizing fuel treatments. Assumptions and variables used in this fire behavior model include the following:

- Weather parameters used were based on Extreme (Archived Dry Creek RAWS Data) percentile weather data to simulate extreme wildfire conditions.
- Moderate weather conditions were used to simulate prescribed fire conditions.
- Crown Fire and Flame Lengths were used as outputs to represent stand replacing fires.

Weather

Weather data utilized for the analysis was obtained from the Dry Creek Remote Automated Weather Station (located about 2 miles from the project boundary). These observations are broken down into ranges based on a 25-year average, and the probability of occurrence during an average wildfire season (May to October). All action alternatives and scenarios independently utilized the Low, High and Extreme environmental conditions. This was performed in order to express the full range of expected fire behavior characteristics, within the area analyzed.

Table 1: Reference Environmental Conditions

Fire Family Plus Percentile Weather Repot for RERAP								
Station: DRY CREEK (id) 452134				Variable: Energy Release Component				
Data Set: 1980 to 2015				Season: May – October				
Wind Direction: North West (290 degrees)								
Environmental and Fuel Reference Conditions by Values of Low-Mod, High, Very High, and Extreme								
Value	**Low-Mod**			**High**		**Very High**		**Extreme**
Percent Range	0	34	35	71	72	92	93	100
Probability %		34		37		21		8
Live and Dead Fuel Moistures								
1 Hour Fuel		10		7		5		3
10 Hour Fuel		12		8		5		3
100 Hour Fuel		15		9		8		6
Herbaceous		55		37		34		31
Woody		108		79		72		70
20’ Wind Speed Avg		6		7		6		4
1000 Hour Fuel		15		12		10		8
4469 Weather Records Used								

Resource Indicators and Measures

Table 2 Resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure (Quantify if possible)	Source (LRMP S/G; law or policy, BMPs, etc.)?
Fire Behavior	The ability of suppression resources to perform safe tactical operations and protect structures, reduce potential for stand-replacing fires, and the increased probability of successful suppression	Reduction in flame lengths	IFTDSS (Interagency Fuel Treatment Decision Support System)

Resource Protection	Reduce risk within and create resilience from fire	Tons per Acre broken down into different Fuel Models. Fuel Model are then ran through IFTDSS simulating spring and fall treatments, as well as summer wildfire (no action alternative) to compare reductions in tonnage	IFTDSS (Interagency Fuel Treatment Decision Support System)

Incomplete and Unavailable Information

Aerial photos do not give the detail that photo series or Brown's method of collecting on the ground fuels data can give and photo series and Brown's method can be very time consuming and costly. Aerial Photos, however, give a way to analyze the landscape but may lack in finite detail. The fuels information gathered for this analysis attempts to take what outputs were given from the EMDS aerial photo data, IFTDSS and field validated much of this information. There are many variants of fuel models present in the treatment areas; those fuel models that represent the higher percentage of landscape were chosen as inputs. An assumption that is made in this analysis is that once a fire is ignited, its behavior is determined by weather, topography, and fuels, but management actions to mitigate its negative consequences are restricted to fuels (Fernandes and Botelho 2003). Topography, which is fairly steep in the project area, is a constant and cannot be changed. Weather is mostly considered a constant in its relationship to different seasons, but should be noted that future prediction scenarios have trajactories in a warmer and drier trend.

Monitoring

Monitoring will be conducted by annual site visits and photos to compare new fuels loadings and whether more treatments are needed to protect against extreme wildfire and promote mature stands. These visits will begin to occur during treatment and after treatments are completed and will continue until fuels staff deem unnecessary.

Environmental Consequences

Existing Condition

Fire History

Large wildfires are common in the Entiat Valley; large fire date and sizes are shown on Figure 1. Through these events, forested habitats have been lost or altered for different wildlife and plant species. Due to these wildfires, suppression rehab, salvage logging, planting and other activities have resulted in changes across this landscape. High intensity recent wildfires; 2014 (Mills Canyon) and 2018 Cougar Creek have affected the project area the most in recent years; vastly changing the landscape and adding to hazardous fuels conditions in some areas. Approximately 9500 acres has had no known wildfire of record. This area is shown in a large portion of the project area in the east end of the project seen in Figure 1 below.

Figure 1: Fire History

Past Treatments

There have been some vegetation treatments within the project boundary that were covered under previous NEPA. Most of the treatments have been in last 20 years. These past treatments made efforts to manipulate fuels and silvicultural objectives, however, when compared to what has not been treated across the landscape as well as the lack of fire occurring recently, there is much need for landscape level treatment.

Figure 2: Past Treatments

Fire Return Interval

There are many portions of the Mad Roaring Mills project that have missed the natural fire return intervals along with fire surrogate treatments (thinning, pruning, piling, and pile burning) despite the recent large fires occurring within project area. In a local study completed by Everett et al, 1999, states "Our results showed that there was a repeatable burn cycle (CV 60%) during the pre-settlement/settlement eras where an area approximately equal to 50±60% of the Nile and Mud Creek sites burned every 6±7 years." This local study was completed in Mud Creek on the Entiat Ranger District, less than 2 miles to the east. Some areas in the project area have missed at least three fire return intervals, while other areas have had no known fire history of occurring in this area. There has been some prescribed fire and fire surrogate treatments completed somewhat recently on Moe Ridge, Crum Canyon, Tyee Ridge and Mud Creek. These treatments help to offset the frequent fire return interval, but those treatments were small scale in size compared to the entire project area.

Wildland Urban Interface

In relation to the Wildland Urban Interface as well as wildland fire threatening large and old trees and forested habitat, a larger amount of Low intensity fire would be desirable. A High Intensity fire, however, would create a situation for firefighting crews that they may not be able to take a direct suppression strategy, where they may have to back off to the next road or ridge. This situation would increase High Intensity acreage fires where the WUI as well as large and old trees and forested habitats would be threatened and increased mortalities in the large and old trees could be expected. There are numerous wildland-urban interface (WUI) areas within the project boundary as well as city of Entiat and community of Ardenvior.

Management Direction

Desired Condition

The Okanogan-Wenatchee National Forest has developed the Forest Restoration Strategy (FRS 2012) that has been updated from a 2010 version and has been a blueprint for forest restoration treatments that the Forest is trying to help streamline landscape restoration. From the introductory paragraphs:

- A concerted effort is needed to restore the sustainability and resiliency of forested ecosystems on the Okanogan-Wenatchee National Forest (OWNF). Numerous assessments of the OWNF, resulting in a long list of peer-reviewed publications, show: (1) increased susceptibility to uncharacteristically large and severe fires; (2) uncharacteristically severe insect outbreaks; and (3) habitats are declining for late-successional and old forest associated species (Lehmkuhl et al. 1994, Hessburg et al. 1999a, Franklin et al. 2007).
- To restore forest sustainability and resiliency, the OWNF needs to substantially increase its restoration footprint, reach across boundaries through collaborative efforts, better integrate across disciplines to accomplish multiple objectives, and adapt to changing conditions and new science.

Much of the Mad Roaring Mills project is attempting to follow a landscape level approach to restoration treatments in conjunction with previous NEPA documents that lie within the project boundary.

Knowing what current and future Fireline Intensities are projected to be, a reduction in fuel loading needs to occur to bring those current and future Fireline Intensity categories into a more of a historic range of variation. These fuel loadings could be reduced through prescribed burning in the spring or fall time seasons. From Scott and Reinhardt, 2001, “A forest that is fire-resilient has characteristics that limit fire intensity and increase the resistance of the forest to mortality. The first principle is to manage surface fuels to limit the flame length of a wildland fire that might enter the stand. This is generally done by removing fuel through prescribed fire, pile burning or mechanical removal. This reduces the potential energy of a wildland fire and makes it more difficult for fire to jump into the canopy.”

A summer wildfire could also bring down fuel loadings; however, a summer fire would come at the cost of those intensities we are trying to limit. Summer wildfires may have results that threaten nearby communities, threaten other state and private forest land, and have potentially negative effects the remaining large and old trees that exist in this planning area. These negative effects may have further effects on many other forested plant and wildlife communities.

Further, desired future conditions would have a more fire adapted ecosystem that would be ready for the future wildfire. These fire adapted ecosystems are maintained by staying in congruence with fire return intervals. Due to mostly successful fire suppression over the last half century or more, many ecosystems are not within current fire return intervals. By using fire through prescribed burning and fire surrogates such as small tree thinning, piling of the slash, and burning of the piles, helps to prepare the landscape as a fire adapted ecosystem that would be ready for the next wildfire.

Until we get to a fire adapted ecosystem that is resilient and ready for the next wildfire, fuel treatments can provide many advantages. Combining fuel breaks with area-wide fuel treatments in adjacent areas can reduce the size and intensity of wildland fires (Agee et.al, 1999). Omi (1996) states "There will always be a role for well-designed fuel break systems which provide options for managing entire landscapes, including wildfire buffers, anchor points for prescribed natural fire and management-ignited fire, and protection of special features (such as urban interface developments, seed orchards, or plantations). In this context, fuel treatments and prescribed burns should be viewed as complements to one another, rather than substitutes."

Environmental Consequences

Alternative One -No Action

Under the No Action Alternative, on site conditions would remain at their current state in the interim. Gradually over time with the absence of fire due to fire suppression activities would cause an increase in fuel loadings. Conifer expansion would continue to become more prevalent within the surrounding landscape. The historic patchy appearance of co-dominate conifers intermixed with dominate ponderosa pine would slowly fill in; and become large expanses of mixed conifer forest. Stands that exhibited park like structures would slowly fill and become more at risk to lethal fire characteristics.

Table 3: Fire Suppression Characteristic Chart

Rating	Flame Lengths (feet)	Suppression Implications
Low	0-1	Fire will burn and spread; however, very little resistance to control and direct attack with firefighters is possible.
Moderate	1-3	Fire spreads rapidly, presenting moderate resistance to control but can be countered with direct attack by firefighters
Active	3-7	Fire spreads very rapidly, presenting substantial resistance to control. Direct attack with firefighters must be supplemented with equipment and/or air support.
Very Active	7-15	Fire spreads very rapidly, presenting extreme resistance to control. Indirect attack may be effective. Safety of firefighters in the area becomes a concern.
Extreme	>15	Fire spreads very rapidly, presenting extreme resistance to control. Any form of attack will probably not be effective. Safety of firefighters in the area is of critical concern.

Table 4: Fire Behavior Output (Flame Length) – No Action Alternative

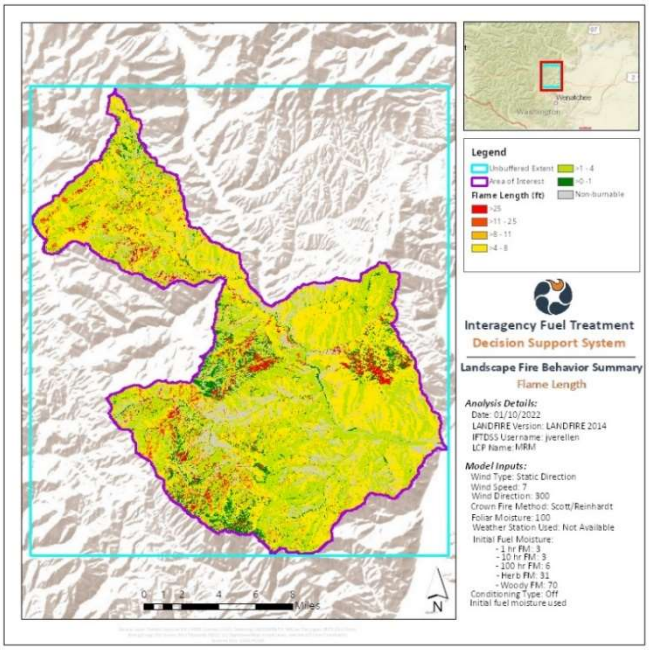
Flame Length (Feet)	Acres Effected	Percent Effected	Suppression Tactics
Non-Burnable	5,931	9	Direct Attack
>0-1	3,908	6	
>1-4	25,101	39	
>4-8	25,254	39	Direct Attack with Equipment
>8-11	1,603	2	Indirect Attack & Aerial Support
>11-25	1,835	3	Indirect Attack
>25	1,501	2	

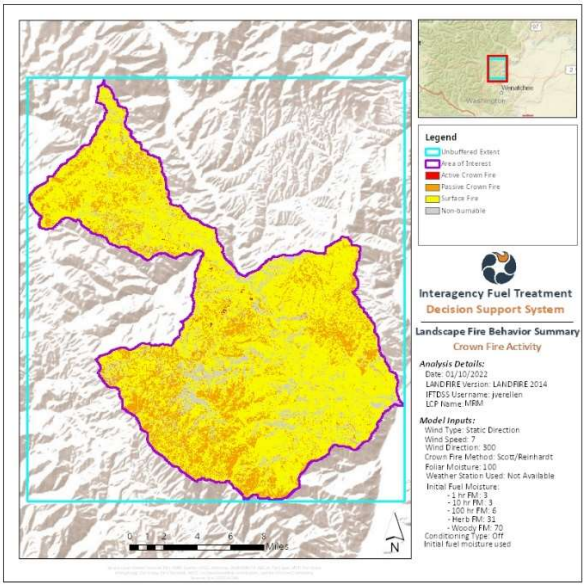
Table 5: Fire Behavior Output (Crown Fire) - No Action Alternative

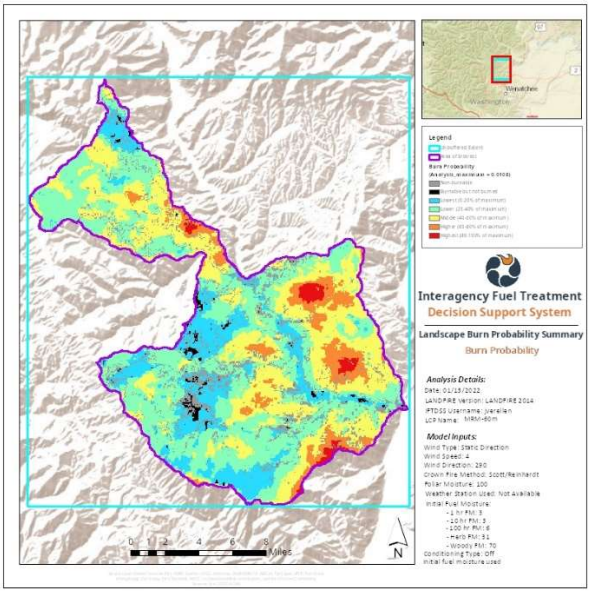
Crown Fire Activity	**Acres Effected**	**Percent Effected**
Non-Burnable	5,931	9
Surface Fire	46,509	71
Passive Fire	12,641	19
Active Fire	52	0

Table 6: Burn Probability - No Action

Burn Probability	Acres	Percent
Non-Burnable	5,966	9
Lowest (0-20% Maximum)	672	1
Lower (20-40% Maximum)	9,311	14
Middle (40-60% Maximum)	24,176	37
Higher (60-80% Maximum)	19,201	29
Highest (80-100% Maximum)	4,757	7







Alternative Two – Proposed Action

Non-commercial thin (NCT), Handpile:
This project proposes to reduce stocking by mechanical thinning 10,795 acres. Small tree thinning (< 8-11 inches diameter), pile slash, and pile burns Trees that are < 8-11 inches diameter will be thinned, piled, and burned. Approximately 2,048 acres of this is resides in the Chiwawa Late Successional Reserve where diameter size for thinning will be restricted to < 8 inches diameter. Ladder fuel reduction involves cutting understory trees to reduce potential for fire to move into the crowns of trees in the middle to upper canopy layers. This action would include creating piles of thinned material to be burned to minimize fuel loading.

There will also be 8,714 acres of low to mixed severity prescribed fire to the landscape outside of Late Successional Reserve(LSR) areas where NCT of <11" will occur. Prescribed burning in the understory

consists of burning brush and downed wood located in timbered stands to reduce surface fuels and mimic natural fire regimes under controlled conditions. Ignition occurs under predetermined weather conditions to minimize tree mortality of residual stands.

Table 7: Fire Suppression Characteristic Chart

Rating	Flame Lengths (feet)	Suppression Implications
Low	0-1	Fire will burn and spread; however, very little resistance to control and direct attack with firefighters is possible.
Moderate	1-3	Fire spreads rapidly, presenting moderate resistance to control but can be countered with direct attack by firefighters
Active	3-7	Fire spreads very rapidly, presenting substantial resistance to control. Direct attack with firefighters must be supplemented with equipment and/or air support.
Very Active	7-15	Fire spreads very rapidly, presenting extreme resistance to control. Indirect attack may be effective. Safety of firefighters in the area becomes a concern.
Extreme	>15	Fire spreads very rapidly, presenting extreme resistance to control. Any form of attack will probably not be effective. Safety of firefighters in the area is of critical concern.

Table 8: Fire Behavior Output (Flame Length) – Action Alternative 1

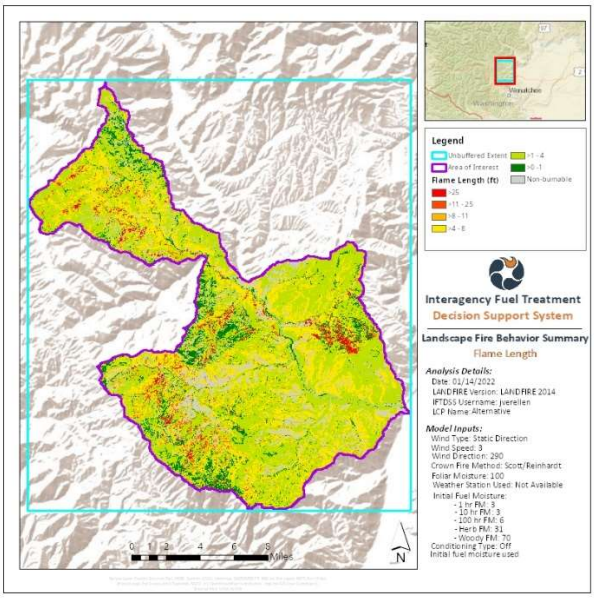
Flame Length (Feet)	Acres Effected	Percent Effected	Suppression Tactics
Non-Burnable	5,931	9	Direct Attack
>0-1	5,343	8	
>1-4	33,118	51	
>4-8	16,984	26	Direct Attack with Equipment
>8-11	1,311	2	Indirect Attack & Aerial Support
>11-25	1,526	2	Indirect Attack
>25	921	1	

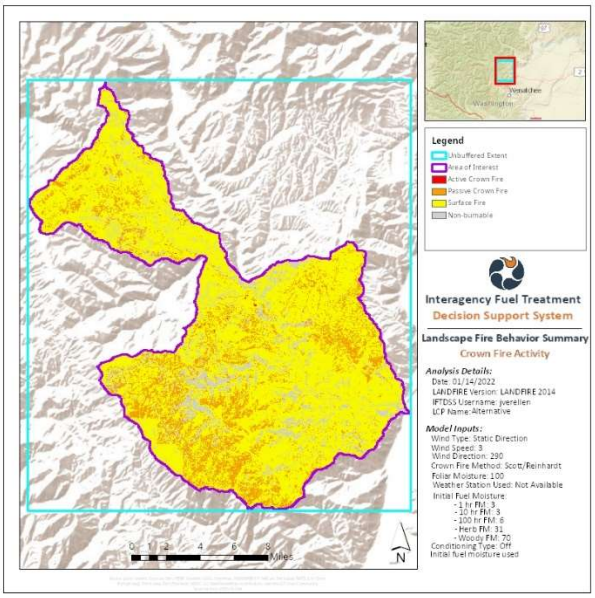
Table 9: Fire Behavior Output (Crown Fire)- Action Alternative 1

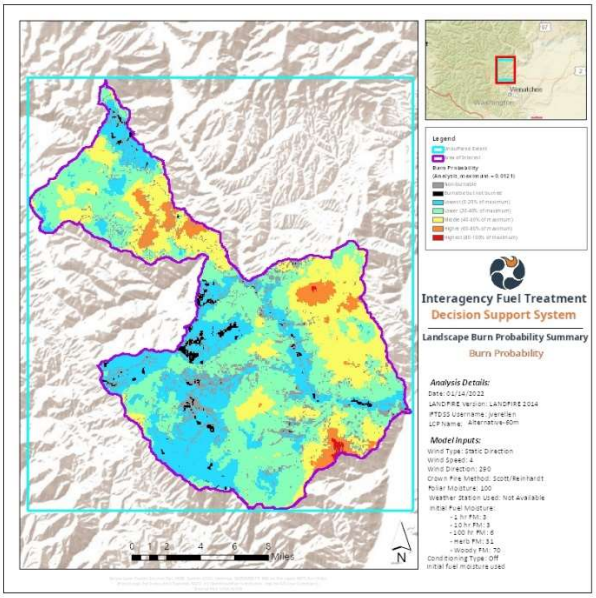
Crown Fire Activity	Acres Effected	Percent Effected
Non-Burnable	5,931	9
Surface Fire	48,521	74
Passive Fire	10,660	16
Active Fire	21	0

Table 10: Burn Probability – Alternative 1

Burn Probability	Acres	Percent
Non-Burnable	5,966	9
Lowest (0-20% Maximum)	1,007	2
Lower (20-40% Maximum)	14,969	23
Middle (40-60% Maximum)	24,767	38
Higher (60-80% Maximum)	2,830	4
Highest (80-100% Maximum)	165	0







Findings and Model Limitations within the report:

• IFDTSS uses flame map fire behavior model and landscape files independently at the pixel level. This program does not calculate fire spread flow paths across the landscape. Potential fire behavior calculations include surface fire spread, flame length, crown fire initiation, and crown fire spread. Because environmental conditions remain constant, the model will not simulate temporal variations in fire behavior caused by weather and diurnal fluctuations, nor will it display spatial variations caused by backing or flanking fire behavior.

• The model does not consider the spatial arrangement of control features as it relates to protection of values, initial or extended attack efforts, or containment opportunities from both small and large fires.

• Environmental conditions utilized for the analysis were from the closest Remote Automated Weather Station on an exposed South Aspect and represent the driest conditions within the project area. In general, actual inventoried environmental conditions observed within NRF are moderated from conditions used for this report.

Project Design Features and Mitigation Measures

All design features and mitigations would be incorporated into all implementation phases of the selected Action Alternatives.

Action Alternatives.

Direct and Indirect Effects

Direct effects of prescribed burning will include combustion of flammable materials as well as producing potentially large quantities of smoke depending on how many acres were burned. Small surface fuels

(under 3 inches) can be expected to be reduced or even consumed down to nothing which is the target for reductions. Larger fuels will be reduced; however those reductions will strive to keep reductions in the 25-50% range.

Indirect effects of prescribed burning will reduce fuel loadings (direct effect) which in turn will bring Fireline intensities down (indirect effect the following summer) to lower than current levels. This will be accomplished by burning in the spring and or fall when not at the peak of fire season when Fireline intensities would be expected to be higher.

Direct effects of non-commercial thinning and hand piling will include the cutting of small trees in an effort to create spacing.

Indirect effects of non-commercial thinning and hand piling will prepare these stands to be more fire resilient by growing larger and producing thicker bark. Increasing spacing as well as reducing ladder fuel opportunities will help to create a stand that is not at risk to crown fire. Thinning larger diameter trees on fuel breaks will help firefighters to have better places to fight fire from in predetermined places, rather than having to do much of the work while the fire is occurring. Indirect effects of burning the handpiles may create areas of intense soil heating, however results from a Tahoe case study further suggest that wood size is the primary factor controlling soil heating during pile burning (Busse et al 2014). Thinning from this project will be less than 10 inches in diameter which is considered small to medium sizes for fuels. Determining ground coverage and ensuring that it does not exceed 15% (or 250 piles per acre) when practicable, is an easy step that can be estimated from a simple field measurement of the number of piles per (acre) within a treatment unit (Busse et al 2014).

Regulatory Framework

Land and Resource Management Plan

Northwest Forest Plan Land Allocations, Standards and Guidelines

Matrix: Standards and Guidelines applying to fire and fuels

- Provide specified amounts of coarse woody debris in matrix management:
    - Objective is to provide coarse woody debris well distributed across the landscape in a manner which meets the needs of species and provides for ecological functions.
        - Manage to provide a renewable supply of large down logs well distributed across the matrix landscape in a manner that meets the needs of species and provides for ecological functions.
        - …In eastern Washington, a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long should be retained (7.5 logs per acre that are 16 inch in diameter and 16 feet long)
            - This equates to 3.75 tons/acre of 16”> material.
            - Some stands in the project area are currently lacking this due to past wildfires, past salvage logging, past wood cutting, as well as there are not many snags on the landscape (to create new down wood).
            - Reductions will target fuels less than 3 inches in diameter. Firing techniques will intentionally not impact large wood.

        - Coarse woody debris already on the ground should be retained and protected to the greatest extent possible from disturbance during treatment (slash burning) (C-40)
- Emphasize green-tree and snag retention in matrix management.
    - For many species, benefits will be greatest if trees are retained in patches rather than singly. …Patches should generally be larger than 2.5 acres. (C-41)
- Modify site treatment practices, particularly the use of fire and pesticides, and modify harvest methods to minimize soil and litter disturbance.
    - Site treatments should be prescribed which will minimize intensive burning, unless appropriate for certain specific habitats, communities or stand conditions. (C-44)
    - Prescribed fires should be planned to minimize the consumption of litter and coarse woody debris. (C-44)\
        - Reductions will target 3 inch and below material
- Fire and Fuels Management
    - For areas in the matrix that are located in the rural interface, fire management activities should be coordinated with local governments, agencies, and landowners during watershed analysis to identify additional factors which may affect hazard reduction goals. Hazard reduction may become more important in the rural interface and areas adjacent to structures, dwellings or other amenities." (C-48)

Late Successional Reserve, Zero acres are within the project area. This section was removed from treatment due to the possible time and money to analyze acres in the LSR. Many guidelines below state the need for treatment. This was left intentionally in this analysis to show that this was analyzed for fire and fuels.

These are Standards and Guidelines applying to fire and fuels

- Management Assessment should be prepared for each large LSR before habitat manipulation activities are designed and implemented. (C-11)
- **Silviculture**: East of the Cascades- Given the increased risk of fire in these areas due to lower moisture conditions and the rapid accumulation of fuels in the aftermath of insect outbreaks and drought, additional management activities are allowed in Late-Successional Reserves (C-12).
    - **Guidelines to Reduce Risks of Large-Scale Disturbance**: Large Scale disturbances are natural events, such as fire, that can eliminate spotted owl habitat on hundreds or thousands of acres. Certain risk management activities, if properly planned and implemented, may reduce the probability of these major stand-replacing events (C-12)
        - These forests occur in drier environments, have had repeated insect infestations, and are susceptible to major fires. Risk reduction efforts are encouraged where they are consistent with the overall recommendations in these guidelines. (C-13)
        - Silvicultural activities aimed at reducing risk shall focus on younger stands in Late Successional Reserves. (C-13)
        - Treatments should be designed to provide effective fuel breaks wherever possible. However … (not to) degeneration of currently suitable owl habitat or other late successional conditions. (C-13)
- Fire Suppression and Prevention:
    - Fuels management in LSR will utilize minimum impact suppression methods in accordance with guidelines for reducing risks of large-scale disturbances. (C-17)
    - In Late-Successional Reserves, a specific fire management plan will be prepared prior to any habitat manipulation activities. This plan, prepared during watershed analysis or as an element of province-level planning or Late-Successional Reserve assessment, should

specify how hazard reduction and other prescribed fire applications will meet the objectives of the Late-Successional Reserve. Until the plan is approved, proposed activities will be subject to review by the Regional Ecosystem Office. The Regional Ecosystem Office may develop additional guidelines that would exempt some activities from review. In all Late-successional Reserves, watershed analysis will provide information to determine the amount of coarse woody debris to be retained when applying prescribed fire. (C-18)

- In LSR's the goal of wildfire suppression is to limit the size of all fires. (C-18)

- The Regional Ecosystem Office has determined that there are Criteria to Exempt Specific Silvicultural Activities in LSRs and MLSAs from REO Review (1995).
  - This primarily pertains to
    - Young Tree Thinning: commonly referred to as TSI or precommercial thinning (<8")
    - Release: also commonly referred to as TSI (<8")
    - Reforestation and Revegetation: including incidental site preparation, release for survival, and animal damage control
- The Assessments for Late Successional Reserves and Managed Late Successional Areas, Eastern Washington Cascades Province, Wenatchee National Forest, Chapter 1, Chiwawa LSR, C. Analysis Within LSR/MLSA, 7. **Fire Management Plan (1997)**, provides guidance for the management of fire in the Chiwawa LSR. These management practices include actions where the role of fire as a disturbance process is important to the management of the reserve.
  - Fire Prevention Actions
    - Emphasize contact with the following special interest groups: Miners, Local homeowner's Associations, and owners of private timber land.
    - Work with utilities on hazard management under high voltage power lines.
    - As a hazard reduction measure emphasize fuel wood collection around recreation use sites in the dry forest type
    - The Following actions are proposed to protect the LSR from fires originating outside LSR boundaries:
      - Maintain and manage existing fuel breaks.
      - Strategic fuel manipulation within and adjacent to LSR boundaries, live and dead, should be included in project design as appropriate.
  - Fire Suppression
    - Spotted owl activity centers are the highest priority for protection of resources (following protection of human life and improvements).
    - Rapid, aggressive initial attack will occur on all dry site ecosystems until vegetation management projects have modified the vegetative condition to where it is in synchrony with inherent disturbance regimes.
    - Improvements will be a priority for protection (recreation facilities, power lines… Sugarloaf Lookout and all guard station facilities.)
    - Adjust pre-planned dispatch cards (Wildcad used now) for the LSR. Utilize the following general direction
      - Use of retardant is appropriate for initial attack
      - Use of aerially delivered firefighters is appropriate
      - Use of dozers needs district ranger's approval
      - Use of burning out is appropriate strategy as situation dictates
      - Escaped Fire Situation Analysis process will be used to guide large fire suppression. Utilize pre-attack plans and materials. These may

be prepared in advanced and updated annually prior to the fire season. (Now WFDSS is used)

- Vegetation Management
  - Returning dry forest types to sustainable conditions is a priority
  - Suggested activities include pruning, thinning, commercial, pre-commercial thinning, wood gathering, and prescribed fire
  - High density, multi-story refugia in mesic sites will be maintained.
  - Prevent the spread of Noxious weeds as feasible
  - Prescribed fire projects in whitebark/subalpine larch ecosystems are encouraged to increase amounts of whitebark pine.
  - Maintain a mosaic of age classes and structural conditions across the landscape outside dry forest to support late successional species.

- Prescribed Fires
  - Prescribed fire opportunities
  - The development and subsequent implementation of Prescribed fire plans should be a priority for this LSR
  - Priorities for the use of Prescribed fire are dry site ecosystems, PIPO, and whitebark pine ecosystems
  - Priority outcomes sinclude hazard reduction near improved sites and urban interface. Projects should be of scale/location to enhance landscape-level diversity tied to inherent disturbance regime
  - Projects should attempt to minimize risk of future catastrophic wildfires (those outside the range of inherent disturbance regimes with respect to size and/or diversity.
- Summary
  - This plan is presented to provide guidance for fire management for the Chiwawa LSR. It is anticipated that changes in additions and deletions will occur as actions are implemented within the LSR. The continuing increased use of prescribed fire is foreseen as actions are implemented to bring the dry site ecosystems in line with the inherent disturbance regimes.

Riparian Reserve: Standards and Guidelines applying to fire and fuels

- FM-1: Design fuel treatment and fire suppression strategies, practices and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function. (C-35)
- FM-2: Locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside Riparian Reserves. (C-35)
- FM-3: Minimize delivery of chemical retardant, foam or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following review and recommendation by a resource advisor, when an escape would cause more long-term damage. (C-35)
- FM-4: Design prescribed burn projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives. (C-36)
- FM-5. Immediately establish an emergency team to develop rehabilitation treatment plan needed to attain ACS objectives whenever Riparian Reserves are significantly damaged by wildfire or a prescribed fire burning outside prescribed parameters. (C-36)

- Other-In Riparian Reserves, the goal of wildfire suppression is to limit the size of all fires. When watershed and/or landscape analysis, or province-level plans are completed and approved, some natural fires may be allowed to burn under prescribed conditions. Rapidly extinguishing smoldering coarse woody debris and duff should be considered to preserve these ecosystem elements. In Riparian Reserves, water drafting sites should be located and managed to minimize adverse effects on riparian habitat and water quality, as consistent with ACS objectives. (C-36)

Wenatchee National Forest Plan –

Standards and Guidelines

- Primary Cavity Excavator Standards and Guidelines (IV-82) states "Provide an average of not less than two dead and down tree segment per acre in decay class 1 and 2, well distributed across the area. Otherwise stated, this would be 2 logs in 20 feet in length 12 inches in diameter.

Protection Guidelines

- Prescribed fire will be used to modify vegetation in an effort to minimize risk of wildfires. Unplanned ignitions may be utilized if a prescribed fire plan has been developed and it is appropriate to the management area affected.
- Prescribed fire will also be used as a resource management tool when appropriate planning indicates it is an efficient and effective option to implement. A prescribed fire that escapes is a wildfire and will receive an appropriate suppression response.
- Management Prescriptions occurring within the MRM Planning area include:

General Forest (GF)

- Goal Statement: Provide for long-term growth and production of commercially valuable wood products at a high level of investment in silvicultural practices. (IV-141)
  - Resource Element: Protection, Fire Hazard Abatement: Treatment of both activity generated and natural fuels is appropriate when coordinated with the timber management practices being implemented. (IV-148)
    - Timber Management Practices (Options)
      - Regeneration Harvest (IV-144)
        1. Clearcut
        2. Shelterwood cut
        3. Seed tree cut
      - Intermediate Harvest (IV-144)
        1. Thin to maintain a minimum basal area that will utilize site potential and produce an economic harvest
        2. Remove dead and dying trees, as economical, from areas not scheduled for regeneration harvest

        Or

        1. Salvage sales should be considered, where dead or dying trees exceed minimum wildlife needs.
      - Timber Stand Improvement (IV-155)
        1. Release regeneration overtopped by competing vegetation
        2. Fertilizer will be used where it is cost effective.

Scenic Travel-Partial Retention (ST-2)

- Goal Statement: Provide a near natural appearing foreground and middleground along scenic travel corridors.
    - Resource Element Protection, Fire Hazard abatement
        - Treatment of both activity generated and natural fuels is appropriate when coordinated with the scenic and recreational values being emphasized in these management areas.
            1. Changes in form, line color, and texture resulting from management activities such as skid trails, landings, and prescribed burning should not be evident for more than two seasons.
            2. Fire Protection measures should not dominate natural patterns of form, line, color, and texture.
            3. Consider a level of prescribed fire where appropriate to maintain a natural appearance and enhance visual quality.
        - Recreational values being emphasized in these management areas are dispersed recreation, travel corridors, etc.

Scenic Travel – Retention (ST-1)

- Goal Statement: To retain or enhance the viewing and recreation experiences along scenic travel routes.
    - Resource Element Protection, Fire Hazard abatement
        - Treatment of both activity generated and natural fuels is appropriate when coordinated with the scenic and recreational values being emphasized in these management areas.
            1. Changes in form, line, color and texture resulting from management activities such as skid trails, landings, and prescribed burning should not be evident for more than one season.
            2. Fire protection measures should not dominate natural patterns of form, line, color, and texture.

Consider a level of prescribed fire, where appropriate, to maintain a natural appearance and enhance visual quality.

Federal Law

Clean Air Act

This action is consistent with the U.S. Clean Air Act because air quality will not be affected by the permit 42 U.S.C 7401 et seq. (1972) These actions will meet air quality standards set by the Clean Air Act (as amended 1990) and as regulated through the Washington State Smoke Management Plan (as revised 1998). Burns will be permitted by the State of Washington when conditions are such that emissions will meet standards set forth in the Smoke Management Plan. If conditions arise that may jeopardize emissions standards, then management will not initiate prescribed fires or curtail burns that are in progress.

Executive Orders

Invasive Species, EO 13112 of February 3, 1999
Migratory Birds, EO 12962 of January 10, 2001
Environmental Justice, EO 12898 of February 11, 1994

State and Local Law

As part of the Healthy Forest Restoration Act of 2004, The Entiat Community Wildfire Protection Plan (CWPP) was created during 2005-2006 to brainstorm and prioritize potential actions to address the most pressing issues that affect the study areas ability to reduce the impacts associated with wildland fires. This planning area was analyzed for treatment but was deferred pending the approval of the CWPP. There has been no further action post the approval of the CWPP.

The Upper Columbia Salmon Recovery Board lists Manage(ing) fuels to represent/restore natural ecosystem profiles and implement Northwest Forest Plan and Entiat Community Wildfire Protection Plan as a short term restoration action to fish habitat. This is not law, however a local entity that aims to improve fish habitat and improve forest health.

Other Guidance or Recommendations

The National Cohesive Wildland Fire Management Strategy is a strategic push to work collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress towards the three goals:

1. Resilient Landscapes
2. Fire Adapted Communities
3. Safe and Effective Wildfire Response

General Guidance for Vegetation and Fuels under the National Cohesive Wildland Fire Management Strategy

- Where wildfires are unwanted or threaten communities and homes, design and prioritize fuel treatments to reduce fire intensity, structure ignition and extent.
- Where allowed and feasible, manage wildfire resources objectives and ecological purposes to restore and maintain fire-adapted ecosystems and achieve fire-resilient landscapes.
- Use and expand fuel treatments involving mechanical, biological, or chemical methods where economically feasible and sustainable, and where they align with landowner objectives

Compliance with LRMP and Other Relevant Laws, Regulations, Policies and Plans

The proposed actions are in compliance with the Land and Resource Management Plans listed above. Some design features in project implementation will be in place to protect large wood as fuels reductions only target fuels 3 inches and less.

Conclusion

Alternative One (No Action)

Under the No Action Alternative (Alternative One), fuels will continue to accumulate over time, resulting in higher Fireline intensities. Fire flow paths will continue to be long and potentially spreading in many directions if no fuels reductions are made. Because of recent wildfires in project area some areas will remain in the No Action Alternative for an unspecified time until fuels have accumulated enough to be a hazard or treatments are needed for reforestation. The fuels treatments polygons covered under MRM are areas surrounded by previously covered fuels treatments; without treating these polygons some fuelbreaks, large burn blocks and mature stands will be at risk to catastrophic wildfire.

Alternative Two

Alternative Two would be implemented over a number of years due to the range of fuel accumulation in different areas of the MRM project area; some have seen fire in last 4 years and some have no fire history of record since 1970. Under Alternative Two, the resource elements of Fireline intensity and fuel loading are lessened over all three drainages within project area. Some improvements are made through noncommercial thinning and prescribed fire to reduce fuel loading which in turn would decrease Fireline intensity. Fireline intensity would help to keep fires less intense and severe, thus protecting valuable natural resources such as large trees and habitat associated with that. Fuel Breaks help to disrupt fire flow paths and give firefighters predetermined areas to fight fires from, saving time and energy when new fires are emerging.

In regards to Fireline intensity, with the proposed fuels treatments in Alternative 2, Fireline intensity values of low, medium, and high values become within range for current Natural Range of Variation (ESR 5) as well as within range for the future Natural Range of Variation (ESR 11). The Proposed treatments would bring both current and future conditions within the historic range, or said differently, bring conditions into the “sweet spot” both now and in the future creating a more fire resilient landscape.

Fuel loading in Alternative 2 is being reduced to bring Fireline intensity values within the current and future Natural Ranges of Variation. As mentioned earlier in this report, current fuel loading is said to be within be within the desired conditions through EMDS analysis. Fuels reductions will target small diameter fuel categories under 3 inches in diameter. These targeted reductions will help to bring Fireline intensities into current and future NRV’s. Having these in place will add efficiencies to suppression efforts and may keep the fires smaller depending on where the fire is located. These gained efficiencies may help to protect the community of Ardenvoir as well as other state and private land from wildfire.

Overall, Alternative two will reduce Fireline intensity through fuels treatments making future wildfires less intense and less severe. These treatments will help connect existing fuel breaks fuels treatments on strategic places on ridge tops and major roads giving firefighters predetermined prepared areas to fight future fires from and decrease impact from large catastrophic wildfires. The tables below show acres and percent difference between acres effected and percent perfected.

The below tables display the benefit amounts in acreage and percent gained post treatment. Some benefits appear to be low in quantitative value; this is due to the recent stand replacing wildfires in the project area. Certain areas are void of trees and surface fuels currently and will need time and tree planting before treatments are to be implemented. The IFTDSS model runs were set for a time frame no more than 9 years; it is not possible to know the fuel model in 10 years; therefore the current fuel model was used in the LSR polygons requiring tree planting and growth which will have very little effect from fuel treatments in the very near future.

Table 11: Fire Behavior Output (Flame Length)

Flame Length (Feet)	No Action Acres Effected	No Action Percent Effected	Alternative 1 Acres Effected	Alternative 1 Percent Effected	Benefit (Acres)	Benefit Percent
Non-Burnable	5,931	9	5,931	9	0	0
>0-1	3,908	6	5,343	8	1,435	2
>1-4	25,101	39	33,118	51	8,017	12
>4-8	25,254	39	16,984	26	7,270	13
>8-11	1,603	2	1,311	2	292	0
>11-25	1,835	3	1,526	2	309	1
>25	1,501	2	921	1	580	1

Table 12: Fire Behavior Output (Crown Fire)

Crown Fire Activity	**No Action Acres Effected**	**No Action Percent Effected**	**Alternative 1 Acres Effected**	**Alternative 1 Percent Effected**	**Benefit Acres**	**Benefit Percent**
Non-Burnable	5,931	9	5,931	9	0	0
Surface Fire	46,509	71	48,521	74	2012	3
Passive Fire	12,641	19	10,660	16	1981	3
Active Fire	52	0	21	0	31	0

Table 13: Burn Probability

Burn Probability	**No Action Acres Effected**	**No Action Percent Effected**	**Alternative 1 Acres Effected**	**Alternative 1 Percent Effected**	**Benefit Acres**	**Benefit Percent**
Non-Burnable	5,966	9	5,966	9	0	0
Lowest (0-20% Maximum)	672	1	1,007	2	335	1
Lower (20-40% Maximum)	9,311	14	14,969	23	5,658	9
Middle (40-60% Maximum)	24,176	37	24,767	38	591	1
Higher (60-80% Maximum)	19,201	29	2,830	4	16,371	25
Highest (80-100% Maximum)	4,757	7	165	0	4,592	7

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